

DEPARTMENT OF AGRICULTURE, BENGAL.

ANNUAL REPORT

OF THE

BURIRHAT AGRICULTURAL STATION

FOR THE

YEAR 1911-1912.



CALCUTTA:

THE BENGAL SECRETARIAT BOOK DEPÔT.

1913.

[ *Price—Indian, 6 annas ; English, 7d.* ]









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# ANNUAL REPORT OF THE BURIRHAT AGRICULTURAL STATION FOR THE YEAR ENDING 30TH JUNE 1912.

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## ANNUAL REPORT OF THE BURIRHAT AGRICULTURAL STATION FOR THE YEAR ENDING 30TH JUNE 1912.

*Introduction.*—This station is situated at Burirhat Hât, five miles north of Rangpur town, Eastern Bengal State Railway, and is devoted entirely to tobacco cultivation and the curing of superior class tobacco.

The area is 52 acres. Soil is sandy on a subsoil of almost pure sand. Excellent cigar tobacco leaf has been grown on  $1\frac{1}{10}$  acre and in 1910-11 the phenomenal prices of Re. 1-4, Re. 1 and annas 12 per lb. respectively were obtained for grades A, B and C of Sumatra tobacco grown on this  $1\frac{1}{10}$  acre. Altogether Rs. 1,555-8 were realized from 17 maunds of wrapper leaf of  $1\frac{1}{10}$  acre, at a cost of Rs. 246-9-9 (exclusive of rent of land and value of cowdung).

For the year 1911-12 cigar leaf crop even better prices have been offered, Re. 1-8, Re. 1-4, annas 6 and annas 12 per lb. being offered for A, B, C and D grades respectively. The money, however, has not yet been realised so the final word has yet to be said on the crop for 1911-12.

To obtain leaf of such quality pucca storing and curing sheds are requisite, and we have at present only sufficient accommodation for  $1\frac{1}{2}$  acres. It is to be hoped that further accommodation will be provided for another acre during the next cold weather to be available for the 1912-13 crop.

In addition to the above good cigarette tobacco leaf is being grown from Turkish, American and local varieties of seed.

The work of producing the best possible Sumatra cigar wrapper leaf and a good class of cigarette tobacco will be continued at this station.

Cowpeas as a green manure for tobacco are being tried extensively.

2. *Situation and brief history.*—The farm is situated in  $89^{\circ}2'$  east longitude and  $25^{\circ}75'N$ . Latitude on the border of a large tobacco-growing belt in the Rangpur district, the area under this crop in this district alone being 180,000 acres. The land was acquired in 1907, an establishment was maintained at the farm from July 1908 and pucca buildings were supplied in 1910-11. Hence the farm is quite young, and the results that have been obtained up to date taking everything into consideration are quite satisfactory.

3. *Area*.—The station is 52 acres in extent, and is divided into five blocks, known as blocks A, B, C, D and E respectively. Of this area 38 acres are cultivable, while 14 acres are occupied by roads, buildings, bamboos, grazing and tank.

4. *Irrigation*.—Theoretically irrigation is not necessary in this district owing to the large rainfall and long monsoon, but practically owing to the sandy nature of the soil and the almost pure sandy subsoil, the best crops of tobacco of the raiyats are only obtained by irrigating from shallow wells. As this farm is especially for tobacco, irrigation becomes a very important factor on the poor land.

5. *Character of the soil*.—The soil is a sandy loam with a subsoil of almost pure sand which occurs at a depth of from 1 to 2 feet from the surface. This kind of soil may be peculiarly suited to tobacco, but it will always be very hungry and in need of manure.

Several of the blocks are almost barren, the soil being too poor to support even a poor crop. Blocks A, D and E are extremely poor and barren in part.

The following are analyses of soils and subsoils from blocks A D and E by Mr. Annett:—

*Report on the composition of six samples of soil from the Burirhat Farm, Rangpur.*

	BLOCK A.		BLOCK D.		BLOCK E.	
	Top 6".	Next 6".	Top 6".	Next 6".	Top 6".	Next 6".
* Organic matter and combined water.	3.21	2.35	3.84	3.44	5.44	4.06
Insoluble silicates and sand.	84.07	85.60	81.85	81.98	80.45	80.86
Iron oxide ...	4.05	3.36	4.62	4.17	4.48	5.04
Alumina ...	5.84	6.02	6.74	7.54	7.78	7.56
Lime ...	0.14	Nil	Nil	Nil	Nil	Nil
Total phosphoric acid ...	0.07	0.07	0.11	0.11	0.12	0.11
Potash ...	0.89	0.77	0.94	0.83	0.86	1.03
Manganese oxide ...	Trace	0.03	Trace	0.03	0.03	Nil
Carbonic acid ...	0.02	0.03	0.01	Nil	0.01	Nil
* Containing nitrogen ...	0.11	0.06	0.11	0.07	0.06	0.05
Available phosphoric acid	0.049	0.053	0.041	0.039	0.040	0.036
Available potash ...	0.012	0.006	0.012	0.019	0.018	0.018

These soils are remarkable for the almost complete absence of lime. They apparently will never be any good for cultivation until lime is applied preferably in several small dressings. After liming they should prove very fertile.



The following are partial analyses of soils and subsoils of the barren and fertile part of block A by Mr. Meggitt :—

Soluble in hydrochloric acid with 12 hours' digestion.	BAREEN AREA.		FERTILE AREA.	
	Sample 1 first 6".	Sample 1a second 6".	Sample 2 first 6".	Sample 2a second 6".
1	2	3	4	5
Phosphoric acid ( $P_2O_5$ ) ..	Per cent, 0·031	Per cent 0·083	Per cent. 0·143	Per cent. 0·112
Potash ( $K_2O$ ) ...	0·534	0·616	0·660	0·684
Lime ( $CaO$ ) ...	0·360	0·515	0·339	0·353
Magnesia ( $MgO$ ) ...	1·191	1·112	1·500	1·696
<i>Soluble in 1 per cent. citric acid with 7 days' digestion.</i>				
Phosphoric acid ...	0·061	0·083	0·107	0·110
Potash ...	0·021	0·015	0·022	0·018
Lime ...	0·085	0·107	0·115	0·099
Magnesia ...	0·095	0·081	0·094	0·093
*Loss on ignition (=organic matter and combined water).	2·864	1·83	3·190	2·767
*Containing Nitrogen ...	0·090	0·049	0·087	0·072
Calcium carbonate ...	0·035	0·032	0·067	0·055

*Reaction of soil*—All very slightly acid.

"These soils present some interesting peculiarities.

"Broadly speaking there are no very marked differences between them. Certainly the differences are not so great as to make it easy to understand why one soil should be much more fertile than the other.

"In the analysis of a soil without doubt the most important figure is the proportion of calcium carbonate, a substance which increases very far-reaching effects on the biological processes of a soil, and thus indirectly on the whole welfare of the same. Lime also exercises most pronounced effects on the texture of soils, and is active in bringing into play the reserves of plant food material lying dormant.



"If we look at these figures we shall see that the amount of calcium carbonate in the fertile soils is, though lamentably small, roughly twice that in the barren soils. In the case of such small quantities, doubling the amount of calcium carbonate (though still leaving the amount very small) might conceivably have a very large effect.

"It will also be seen that the total lime and also that soluble in one per cent. citric acid are also very small.

"The ratio of "total" magnesia to "total" lime is in all the soils far too high, being generally in the proportion of 3 or 4 to 1. Though this is not shown in the "available" condition, still the fact that the soil contains a larger reserve of magnesia will, in the ordinary course of soil processes, constantly tend to a too high ratio for magnesia to lime.

"As regards the other constituents, I should describe the total phosphoric acid in samples 1 and 1a as inadequate and that in samples 2 and 2a as adequate. The total potash is ample in all samples.

"Total lime as previously remarked is low and bears too low a ratio to the total magnesia present.

"With regard to the available constituents there is certainly no lack of  $P_2O_5$  or  $K_2O$ . Indeed in sample 1 and 1a the available  $P_2O_5$  is actually equal to that obtained by solution in hydrochloric acid, and in the case of 2 and 2a the "available"  $P_2O_5$  is very little less than the "total." Thinking that I might not have extracted the soil sufficiently long with hydrochloric acid, I repeated the experiment, extracting for periods twice and four times as long as the first extraction. These further experiments gave me figures almost identical with those given. It seems an extraordinary thing that the ratio between total and available  $P_2O_5$  in these soils should be so low; it is almost 1:1 in all cases and it, of course, suggests that there are practically no reserves in these soils.

"It is especially extraordinary as there is quite a fair percentage of iron in the soil. It suggests of course that the phosphoric acid is almost entirely present as some easily soluble compound, probably a lime compound. Certainly in the case of samples 1 and 1a where the total and available  $P_2O_5$  are identical figures, the amount of available lime is rather more than sufficient to account for the available  $P_2O$  in the form of tricalcic phosphate. In sample 1a I actually found some small particles of bone.

"These soils, though not rich in nitrogen, cannot be said to be very deficient. Judging from the loss on ignition and the percentage of nitrogen the amount of organic matter, though not high, compares favourably with most Indian soils. Still both might be increased with advantage.

"With the object of studying the effect of lime on these soils two plots, each 1 bigha in area, were set out on the worst portions of block A and block D two years ago, and slaked lime was applied at the rate of 10 maunds (820 lbs.) per acre. It is intended to repeat the dose annually for five years. The plots are green manured in the rains and a *rabi* crop (*e.g.*, tobacco, mustard or oats) is taken in the cold weather."

"Lime was applied to both the plots in and blocks A and D for the second year at the rate of 10 maunds (820 lbs.) per acre.

"A crop of mustard was grown in block A in the *rabi* season, but it has failed so far."

"In block B the effect of the lime so far is very small."

Mr. Meggitt says practically speaking, the soils are rich in available phosphoric acid and potash, poor in lime and, although not rich in organic matter and nitrogen, they cannot be said to be deficient in these ingredients. There is a fair percentage of iron in the soil.

From the agriculturists' point of view the soils are extremely hungry and poor in organic matter with no retentive power whatsoever and they will require very heavy applications of organic manures every year to ensure successful crops.

The following observations on blocks A, B, C, D and E in the last week of January 1913 fully bear this out.

There are five blocks of land at this farm, viz., A, B, C, D and E.

Blocks.	Area in acres.		Condition of crops, January 25th, 1913.
A	...	5	Barren.
B	...	3½	Good.
C	...	8	Poor in parts and good in others.
D	...	10	Poor.
E	...	12	Do.
		<hr/> 38	
		<hr/>	

*Treatment.*—Block A has been treated as follows:—

1912-13.

<i>Kharif</i>	..	Cowpeas (green manured)	{	Lime 30 maunds
		5 acres and manured	{	per acre.
		with	{	Oilcake 10 maunds.
<i>Rabi</i>	...	Mustard 4 acres	...	A failure.
		Tobacco 1 acre manure,	{	75 maunds cow-
		condition of crop good.	{	dung.
			{	5 maunds oil
			{	cake.

1911-12.

<i>Kharif</i>	...	Cowpeas green manured.
<i>Rabi</i>	...	Mustard which failed except north-east corner.

1910-11.

<i>Kharif</i>	...	<i>Dhaincha</i> green manure.
<i>Rabi</i>	...	Oats failed except in north-east corner.

1909-10.

<i>Kharif</i>	...	Cowpeas green manure.
<i>Rabi</i>	...	Mustard failure except in north-east corner.

At the end of January 1913 with the exception of the north-east corner where one acre of tobacco, which has been manured with 75 maunds cowdung and 5 maunds of mustard cake, is doing fairly well, the mustard is very poor and patchy and in the southern half the crop has failed altogether.

In this southern half there are three check plots which have all been green manured with cowpeas, only one of which has been limed at the rate of 10 maunds per acre for the past three years. The mustard has failed entirely on all three plots. Even where oilcake 10 maunds plus lime 30 maunds per acre were applied to the cowpeas, the mustard crop is very poor and on the better north-east corner it has required lime 30 maunds per acre, oilcake 10 maunds per acre, plus cowpeas (green manured) in addition to 75 maunds cowdung plus 5 maunds mustard cake to produce a fair crop of tobacco which is not equal to the tobacco crop of block B which received only cowpeas green manured in addition to 100 maunds cowdung per acre.



ERRATUM TO THE ANNUAL REPORT OF THE RANGPUR FARM  
FOR THE YEAR 1911-12.

For page 2, paragraph 5, "*Highland*—The soil . . . paddy land" in page 3 of the same *paragraph*, read:—

"*Highland*.—The soil is a rich, moist loam of light texture, very easily worked and always in good heart. For tobacco, it is perhaps too moist and not light enough. The subsoil at a depth of 3 or 4 feet is almost pure sand. A sample of soil taken from the tobacco-growing portion of the Farm was analysed during the year by the Imperial Agricultural Chemist at Pusa. Dr. Leather's report on the composition of the soil is as follows:—

MECHANICAL COMPOSITION.			
		Diameter. Per cent.	
Clay	... Smaller than	= .002	.74
Sand	... ..	.002 = .004	3.81
"	... ..	.004 = .008	5.76
"	... ..	.008 = .016	8.78
"	... ..	.016 = .032	28.59
"	... ..	.032 = .120	42.25
"	... Larger than	= .120	5.90
			<hr/> 95.83
Organic matter and combined water		...	.. 4.17
			<hr/> 100.00 <hr/>

This soil is similar to the Ganges alluvium and is a thoroughly open soil.

CHEMICAL COMPOSITION.

Carbonate of lime	...	...	...	.091
Organic nitrogen	...	...	...	.101
Available phosphoric acid	...	...	...	.098
Available potash	...	...	...	.065

This soil contains very little carbonate of lime, but is unusually rich in nitrogen, phosphate and potash. If it is regularly manured with farmyard manure, it should pay to lime it once in about 10 years."



Block B which is growing a very good crop of tobacco (January 1913), has been treated as follows :—

1912-13

*Kharif* ... Cowpeas green manured. No lime.  
*Rabi* ... Tobacco, 100 maunds coddung per acre.

1911-12.

*Kharif* .. *Dhaincha* green manured.  
 Oats.

1910-11.

*Kharif* ... Cowpeas green manured.  
*Rabi* ... Tobacco, 150 maunds coddung.

1909-10.

*Kharif* ... Juar.  
*Rabi* ... Fallow.

Block C, which is growing (January 1913), a good crop of oats and peas on the north two-thirds and a poor crop on the south one-third has been treated as follows :—

1912-13.

*Kharif* ... Cowpeas green manured. No lime.  
*Rabi* ... Oats and peas.

1911-12.

*Kharif* ... Cowpeas green manured.  
*Rabi* ... Tobacco, 150 maunds coddung per acre.  
 Oats and peas.

1910-11.

*Kharif* ... *Aus* paddy.  
*Rabi* ... *Mati kalai*.

1909-10.

*Kharif* ... Cowpeas green manured.  
*Rabi* ... Tobacco, 75 maunds coddung.

Block D, which has (January 1913) a fair crop of Turkish tobacco growing and poor crops of Virginian tobacco, has been treated as follows :—

1912-13.

*Kharif* ... *Aus* paddy.  
*Rabi* ... Tobacco, 10 maunds mustard cake per acre, or  
 75 maunds coddung }  
 5 „ mustard cake } per acre.



One plot, one bigha in extent, has been limed at the rate of 10 maunds per acre for the past three years. At present the effect of the lime is very small.

## 1911-12.

<i>Kharif</i>	...	Cowpeas green manured.
<i>Rabi</i>	...	Oats.

## 1910-11.

<i>Kharif</i>	...	Cowpeas green manured.
<i>Rabi</i>	...	Tobacco, 75 maunds cowdung per acre, Top dressed 5 " oilcake. Irrigation also necessary.

## 1909-10.

<i>Kharif</i>	...	<i>Aus</i> paddy.
<i>Rabi</i>	...	<i>Mati kalai</i> .

Irrigation is now necessary or the tobacco crop will be very poor.

Block E had in January 1913 got poor crops of tobacco growing.

The following treatment has been given to this block :—

## 1912-13.

<i>Kharif</i>	...	Cowpeas or <i>dhaincha</i> green manure.
<i>Rabi</i>	...	Tobacco, 100 maunds cowdung per acre or
		Topdressing { 75 " " "
		2 maunds { 5 " mustard cake per acre.
		saltpetre. { 50 " cowdung per acre.
		{ 5 " mustard cake per acre.

## 1911-12.

<i>Kharif</i>	...	<i>Juar</i> or <i>aus</i> .
<i>Rabi</i>	...	<i>Nil</i> or <i>mati kalai</i> (no gram formed).

## 1910-11.

<i>Kharif</i>	...	Cowpeas green manure.
<i>Rabi</i>	...	Mustard.

## 1909-10.

<i>Kharif</i>	...	<i>Dhaicha</i> green manured.
<i>Rabi</i>	...	Oats.

Accordingly out of all these 38 acres there are only about 5 acres of land that will produce a fair to good tobacco crop, the remaining area being too poor to grow crops economically.

6. *Meteorology.*—The rainfall of this district is very heavy and is well distributed over the period, April to October. The following table gives the rainfall and number of rainy days during 1911-12 as compared with the normal :—

		ACTUAL RAINFALL.		NORMAL RAINFALL FOR DISTRICT.	
		Rainfall.	Number of rainy days.	Rainfall.	Number of rainy days.
1911.					
April	...	6.12	8	3.61	4.3
May	...	11.54	19	10.66	11.5
June	...	15.12	23	18.00	15.7
July	...	9.74	20	15.89	15.0
August	...	14.27	19	12.80	13.7
September	...	10.79	19	14.24	13.3
October	...	8.66	12	4.87	4.4
November	...	Nil	...	0.12	0.2
December	...	Nil	..	0.05	0.2
1912.					
January	...	0.04	1	0.50	0.9
February	...	0.03	1	0.54	1.2
March	...	2.24	4	1.25	1.8
		78.55	126	81.93	81.8

From the figures it is seen there is no lack of moisture from April to October, but the tobacco crop is only planted in October-November and the soil is so porous that although the land is flooded sometimes in September, by October the soil is quite powdery, by November the soil is very dry and in December it is necessary to irrigate the poor soils if heavy crops of tobacco are wanted.

The soil of this farm is too poor for jute and sugarcane, otherwise the elevation and texture of the soil are ideal for such crops.

In 1911-12 the rainfall was about normal and was exceedingly well distributed over the whole period—April to October.

7. *Operations during the year.*—(a) *General crops grown.*—The following table gives the area of each crop in each block with the total outturn and yield per acre:—

NAME OF THE CROP.	Area in acres.	Block in which grown.	Total yield in maunds.	Yield per acre.	REMARKS.
<i>Kharif.</i>					
Cowpea as green manure	24	A, C and D			
<i>Dhaincha</i> ditto,	3 $\frac{3}{4}$	B			
Guinea grass (see <i>rabi</i> )	$\frac{1}{10}$	C			
<i>Aus</i> paddy ...	8	E	122 $\frac{1}{2}$	15 $\frac{1}{2}$	Fair.
<i>Juar</i> ...	2 $\frac{1}{2}$	E	348 $\frac{1}{2}$	138	Fair.
<i>Ginger</i> ...	$\frac{1}{10}$	D	10 $\frac{1}{2}$	107 $\frac{1}{2}$	Good.
<i>Euchleana Mexicana</i> ...	$\frac{1}{10}$	D	<div> <div>30 fodder</div> <div>9<math>\frac{1}{2}</math> seed</div> </div>	<div> <div>300</div> <div>92<math>\frac{1}{2}</math></div> </div>	Good.
Groundnut ...	$\frac{1}{10}$	D	Failed.		
<i>Rabi.</i>					
Tobacco ...	3.79	C and D			
Mustard ...	5.50	A	11 $\frac{1}{2}$	2	Bad.
Oats for fodder ...	12.57	B and D			
Oats and peas mixed as fodder.	5.00	C	316	63	Fair.
Potatoes ...	0.49	D	38 $\frac{1}{2}$	76	Bad.
Guinea grass ...	0.25	...	186 $\frac{1}{2}$	273	Good.
<i>Mati kalai</i> ...	8.00				

*Cowpeas*.—This crop grew fairly well and was green manured in August incorporating well with the soil.

*Dhaincha* grew very well and was easily green manured in August.

Guinea grass thrived exceedingly well and gave two cuttings.

*Aus* paddy was only fair.

*Mati kalai* grew well but did not form pods so was green manured.

*Juar* was only fair although heavily manured with 150 maunds cowdung per acre.

*Ginger*.—Four varieties were grown, viz., Jamaica, Cochin, Calicut and local.

The yields will be seen from the following table:—

Name of variety.	Area in acres.	Actual yield.		Yield per acre.
		Mds.	Srs.	Mds.
Jamaica ...	$\frac{1}{40}$	2	0	80
Cochin ...	$\frac{1}{40}$	2	30	110
Calicut ...	$\frac{1}{40}$	2	25	105
Country ...	$\frac{1}{40}$	3	15	135

Hence the local variety which is most preferred in the local markets gave the heaviest yield.

*Euchleana Mexicana*.—This fodder crop which much resembles *juar* thrived well.

Groundnut failed.

Tabacco is treated more fully below.

*Mustard*.—This crop was bad owing to the poverty of the soil.

Oats were sown too late with the result that rain fell soon after harvesting. The crop could not be threshed and had to be fed off to the bullocks. The crop thrived well.

Oats and peas grew fairly well.

Potatoes were poor. The Darjeeling seed yielded better than the local seed.

(b) *Experimental work*.—Tobacco cultivation and the curing of the leaf.



The scheme of experiments was practically the same as that followed in previous years. The object being—

- A. To produce a high grade cigar wrapper leaf.
- B. To produce tobacco suitable for the manufacture of good class cigarettes.
- C. Besides A and B experiments were made with different varieties of tobacco to grow "pure lines" to test the purity of the farm-grown seed.

The variety grown for cigar wrapper was Sumatra, of which 1.25 acres were planted in block C and 0.66 acres in block D. A new variety called "Uncle Sam Sumatra" was grown experimentally on 0.05 acre. For the production of cigarette tobacco white Burley was grown on 1.00 acre in block C. In addition to the above the following varieties were grown on 0.59 acre to test the purity of the seeds:—

I. *American*—

- (a) White Burley.
- (b) Common Burley.
- (c) Connecticut seed leaf.
- (d) Yellow Prior.
- (e) Little Flemingen.

II. *Sumatra*.

III. *Turkish*—

- (a) Some sown.
- (b) Cavella.
- (c) Sari.
- (d) Ayasalouk.

For this work seeds from each plant were kept separate and sown in lines.

As tobacco is liable to cross fertilisation the experiment was started in consultation with the Economic Botanist, Eastern Bengal and Assam. The following is quoted from a copy of a letter No. 5, dated the 4th April 1911, from the Economic Botanist to the Director of Agriculture, Eastern Bengal and Assam:—

"My point for growing 'pure lines' has not fully been understood. Though all the plants kept for seeds of one particular variety appear absolutely true to type they may yet have been crossed during that season. You cannot tell

whether this has happened or not until you sow the seeds from such plants separately next season and examine the offspring. If the seed parent had not been crossed and was pure, all the offspring should be exactly like the parent plants and like each other. If the parent was crossed variant plants will appear amongst the offspring. My suggestion therefore was that the seeds from the plants (of all varieties) which have been kept for seed, bagged or unbagged, should be kept separately, sown and transplanted separately, next year."

7 *Tobacco: Scheme of experiment.*—The accompanying table shows the varieties of tobacco grown during the year and some particulars of their cultivation with the method of curing:—

Serial No.	Class of tobacco.	Variety.	Source of seed.	Area in acres.	Rotation.	Manure per acre.	Time of transplanting.	Date of commencement of harvest.	Mode of harvesting.	Number of leaves kept on a plant.	Mode of curing.	REMARKS.
A	Cigar leaf tobacco.	Sumatra	Farm-grown seed of 1910-11.	1 acre in C.	Green manured with cowpea.	150 maunds of well rotten cowdung per acre plus 35 seers saltpetre to backward plants (top dressing).	26th October 1911 to 30th October 1911.	18th December 1911.	Basal leaves primed, the rest cut whole.	18 to 20 leaves.	Shade curing.	The tobacco cured a bright mahogany colour, and is suitable for cigar wrapper.
	Ditto ...	Ditto ...	Ditto ...	33 acres in D.	Ditto ...	150 maunds of cowdung per acre and lime at the rate of 10 maunds per acre applied for the 2nd year.	5th November 1911.	24th February 1912.	Ditto ...	Ditto ...	Ditto.	
	Ditto ...	Ditto ...	Ditto ...	Ditto ...	Ditto ...	150 maunds of cowdung per acre but no lime (check plot).	6th November 1911.	17th March 1912.	Ditto ...	Ditto ...	Ditto	Manuring with lime did not do much good. The outturn per acre in the check plot was 30 seers more than in the lime plot, vide paragraph 3 on soil in this report. Lime seemed to have so speedily acted upon the organic matter that during dry months the soil did not possess sufficient moisture. The tobacco cured dark, rather unfit for cigar wrapper. The leaves were small. The soil was too poor to grow a good crop.
	Ditto ...	Ditto ...	Ditto ...	25 acres, block C.	Ditto ...	150 maunds of well rotten cowdung per acre.	17th November 1911.	23rd February 1912.	Ditto ...	Ditto ...	Ditto.	

Ditto ...	Uncle Sam Sunatra.	Fresh seed from America.	0.05 acres, block C.	Ditto ...	Ditto ...	Ditto ...	13th March 1912.	Ditto ...	Ditto ...	The seeds were found practically a mixture of three or four varieties. A few plants that appeared to be like Sunatra were harvested separately and cured but the tobacco did not turn out well. Further experiments will be necessary before passing any definite opinion on this variety.	
American Cigarette tobacco.	White barley.	Fresh seed from America.	1 acre ...	Green manured with cowpea,	150 maunds of cowdung per acre, besides 1 maund 8 seers saltpetre (refined) top dressed per acre.	1st November 1911 to 7th November 1911.	16th February 1912.	Basal leaves pruned, the rest cut whole with spitting.	13 to 15 leaves.	F i r e cured.	The seeds of this variety as in the case of Uncle Sam Sunatra were found to be a mixture of three or four varieties. The crop did not resemble the white barley, besides most of the leaves remained flat on the surface of the soil, and as such got very much mixed up with sand. However, the tobacco has mostly cured good as valued by Messrs. D. Macropolo & Co. Bombay. If the variety had turned out to be the real white barley far better results might have been obtained.



## Yield of Tobacco, 1911-12.

Serial No.	Name and variety of tobacco.	Area planted in acres.	Method of curing.	Grade of tobacco.	Actual outturn.	Outturn per acre.	Actual cost of cultivation and curing.	Cost of cultivation and curing per acre.	Cost of cultivation and curing per maund.	REMARKS.
Block O Cigar leaf tobacco.	Sumatra	1.00	Shade-cured	I.-Wrappers and binders.	Mds. s.	Mds. s.	Rs. A. P.	Rs. A. P.	Rs. A.	The growth was fair, but owing to the outbreak of "tobacco wilt" the yield was adversely affected. About one-tenth of the crop practically failed.
					...	...	...	...	...	
				(a) Mahogany colour—						
				Large ...	8 30					
				Medium ...	1 15					
				Small ...	0 25					
				(b) Dark colour—						
				Tobacco of all sizes ...	3 30					
				II.—Bispaq or inferior leaves.	0 38					
				Total	15 18	15 18	212 13 3	212 13 3	13 11	

Block C ...	Sumatra	0.25	Ditto	I.—Wrappers and binders—	...	...	...	...	...	The soil is very poor in this plot, accordingly the growth was stunted.
				(a) Mahogany colour—						
				Large ..	...	0 33				
				Medium ..	...	0 11				
				Small ..	...	0 7				
				(b) Dark colour—						
				Tobacco of all sizes ..	...	0 23				
				II.—Bispat ..	...	0 6				
				Total ..	...	2 6	8 24	...	...	...

*Tobacco.—Yield and cost of cultivation and curing.*—The following tables give particulars of the yields, cost of cultivation, etc., of those varieties which grow sufficiently well to be included in the curing experiments:—

Serial No.	Class of tobacco.	Variety.	Source of seed.	Area in acres.	Rotation.	Manure per acre.	Time of transplanting.	Date of commencement of harvest.	Mode of harvesting.	Number of leaves kept on a plant.	Mode of curing.	REMARKS.
B	Turkish cigarette tobacco for growing pure lines.	(a) Some sown	Farm grown seeds of 1910-11.	0.04	Green manured with cow-pea.	150 maunds of cow-dung per acre.	28th October 1911 to 28th October 1911.	4th February 1912.	Cut whole	20 to 22 leaves.	Shade-curing.	These varieties were grown mainly for study of the purity of the seeds. However, the tobacco, in the words of Messrs. D. Macrepolo & Co., Bombay, cured fairly good.
		(b) Cavalla		...	...	...	Ditto	Ditto				
		(c) Sari		...	...	...	Ditto	Ditto				
		(d) Ayasoluk		...	...	...	Ditto	Ditto				
A & B.	Sumatra and American tobaccos for growing pure lines.	(a) White burley.	Ditto	0.59	Green manured with cow-pea.	150 maunds of cow-dung per acre.	30th October 1911 to 3rd November 1911.	8th February 1912.	Basal leaves primed, the rest cut whole with skiving, excepting Sumatra which was cut whole.	10 to 15 leaves.	White burley was flue-cured, the rest cured under shade.	Ditto. Some of the shade-cured tobacco turned out quite well for cigarette manufacture. White burley cured bright yellow.
		(b) Canon burley.										
		(c) Connecticut seed leaf.										
		(d) Sumatra.										
		(e) Yellow prior.										
		(f) Little Flemington.										
B.	Local Rangpur.	Bhengi	Ditto	0.20	Ditto	Ditto	2nd November 1911 to 17th November 1911.	5th April 1912	Primed in the local method.	10 to 12 leaves.	Sun cured	The crop was very much injured by haultorm.



Block C ...	Uncle Sam Sumatra.	0'05	Shade cured	Tobacco of all lengths	5	0	2	...	...	This is a new variety from America. The seed was found to be very much mixed and of different varieties; such plants as appeared to be like Uncle Sam were harvested, and the rest rejected; growth was very poor owing to the poverty of the soil in this plot.
American cigarette tobacco.	White Barley ...	1'00	Flue cured	Tobacco of all grades	6	27				
			Shade cured	Ditto	1	18				
				Total	18	5	8	5	187	8
									6	23
Turkish tobacco.	Four varieties grown for pure lines as follow :— (1) Some sown. (2) Cavalla. (3) Sari.	0'04	Shade cured	Tobacco of all grades	0	11	6	35	...	The variety turned out to be a freak type; growth was very poor. This was partly due to the poverty of the soil.
	(4) Aya-Solouk.									
Block C— Sumatra American varieties.	Six varieties grown for pure lines as follow :— (a) Sumatra. (b) White Burley. (c) Cannon Burley. (d) Connecticut seed leaf. (e) Little Flemington. (f) Yellow prior.	0'59	Flue cured	Tobacco all grades	0	31				
			Shade cured	Ditto	1	20				
				Total	2	10	8	33	...	In this plot most of the crop did not grow owing to the uneven and poor soil.

Serial No.	Name and variety.	Area planted.	Method of curing.	Grade of tobacco.	Actual outturn.		Outturn per acre.	Actual cost of cultivation and curing.	Cost of cultivation and curing per acre.	Cost of cultivation and curing per maund.	REMARKS.
					Mds. srs.	Mds. srs.		Rs. A. P.	Rs. A. P.	Rs. A.	
Block C— Sumatra American varieties— concluded.	Bhengi tobacco ...	Acres.	Shade cured	Tobacco of all lengths. Bispat ...	1 10			...	...	...	The crop did not grow well owing to poor soil; besides crop was very much damaged by hail-storm; both the quality and quantity turned out to be very poor.
					0 10						
					1 20		7 20				
Block D, Cigar leaf tobacco.	Sumatra ...	0.33 acres.	Shade-cured	Tobacco of all lengths and colour. Bispat ...	2 20			.....	.....	...	In this block the tobacco does not grow well; the effects of lime do not seem encouraging.
					0 10						
					2 80		8 10				
Ditto ...	Ditto ...	Ditto	Ditto	Tobacco of all lengths and colour Bispat ...	2 28						
					0 11						
					2 39		8 37				

As will be seen from the table, variety experiments were made specially in two plots, one acre each in area. The outturn of Sumatra tobacco was fair, while that of White Burley was very poor; the causes of this have already been explained. The outturn on block D was very poor owing to the poverty of the soil. The actual cost of cultivation and curing per maund of Sumatra and White Burley is shown in column 10 of the statement. This includes all expenditure except rent of land and value of cowdung, which was produced on the farm. As the outturn of White Burley was very poor this year owing to causes which were rather accidental, the cost of production per maund would appear much more than what would be incurred in better soil with a true White Burley crop. The cost of fuel in curing this variety has not been taken into account as shown in column 10. This would probably increase the cost by from Rs. 5 to Rs. 6 per maund of cured leaf if the fuel had to be purchased.

*Prices of tobacco.*—Our 1910 crop of Sumatra realized from 12 annas to 7 annas per pound according to quality. The total amount sold to Madras cigar manufacturers was 13 manuds 15 seers which realized the sum of Rs. 587-11, while the cost of production was only Rs. 193-15.

The 1910 fire-cured crop of cigarette tobacco was of fair quality but it deteriorated through being stored too long on the farm where at that time there was no suitable store-house, and it finally had to be disposed of at a nominal figure.

The 1911 prices are far ahead of anything previously realized for tobacco grown in this district,

The Sumatra grown on  $1\frac{1}{10}$  acres in block B was sorted into four grades according to size and quality of leaves. The three top grades were sold to a Madras firm of cigar manufacturers at the following prices:—

Grade.	Quality.	Price.	Rs.	A.
A	... 862 lbs. at Re. 1-4 per lb.	=	1,077	8
B	... 286 „ „ „ 1-0 „ „	=	286	0
C	... 256 „ „ „ 0-12 „ „	=	192	0
Total	1,404 lbs.		1,555	1

This works out at an average price of Re. 1-1-8 per lb. for 1,404lbs. of tobacco. The price per maund (of 82lbs.) is as follows for each grade:—

Grade.			Rs.	A.	P.
A	...	...	102	8	per maund.
B	...	...	82	0	„ „
C	...	...	61	8	„ „

The cost of cultivation and curing of the tobacco sold for Rs. 1,555-8 was Rs. 246-9-9 (exclusive of rent of land and value of cowdung).

The 1911 crop of fire-cured cigarette tobacco was sold locally and realized the following prices:—

Variety.		Quantity.		Price.
White Burley	...	5 maunds	at Rs. 37-8	per maund.
Little Flemingen	...	7 „	„ „ 35	„
Connecticut seed leaf	13	„	„ „ 25	„

A small quantity of Turkish tobacco which was successfully fire-cured was sold to a Bombay firm of cigarette manufacturers at the following prices:—

1st quality	...	19 seers	at Rs. 81-4	per maund.
2nd „	...	28 „	at „ 50	„

*Sumatra.*—The 1912 crop has not yet all been sold. The Sumatra which is shade-cured still remains to be sold. There are 20 maunds 23 seers of this kind of tobacco in stock, and this was obtained from 1.91 acre. From 1 acre 15 maunds 18 seers were obtained.

This tobacco has been divided into four grades, viz., A, B, C, D, and we have had the following valuations from Trichinopoly:—

Grade.		Rs.	A.		Rs.	A.
A	...	...	1	8 per lb. or	123	0 per maund.
B	...	...	1	4 „	102	8 „
C	...	...	0	6 „	30	12 „
D	...	...	0	11 „	56	6 „



For cigarette tobacco all the American varieties [except the lower Virginia leaves (*bispat*) which were shade-cured] were fire-cured and mixed together for sale.

Two maunds were sold at Rs. 32-8 per maund, while 9 maunds 5 seers at Rs. 25 per maund were sold.

*Turkish*.—This variety was shade-cured. Only  $\frac{1}{25}$ th of an acre of Turkish was grown for seed purposes. This yielded 11 seers of leaf which was sold at the rate of Rs. 70 per maund. The cost of production of tobacco at this farm will not be any guide owing to the poverty of the soil. At the end of this report in Appendix B will be found valuations of the 1912 crop.

(c) *Conservation of cattle-dung*.—The cowdung is stored in kutchapits and protected from the sun, but there are no definite figures yet worth publishing as to the value of such procedure as compared with the methods practised by the ordinary raiyat.

(d) *Distribution of seed*.—The following seeds were distributed during the year :—

Tobacco seed 15 oz. and seedlings sufficient to plant 4 acres.

The Planet Junior hand hoe and Hindustan plough were in constant use on the farm.

(e) *Practical training of young men*.—One apprentice received training during the year. A dozen cultivators in the locality were trained to follow our methods and obtained Rs. 22 per maund for their tobacco as against Rs. 14 for the local produce.

8. *Receipts and Expenditure*.—The following were the total receipts and expenditure during the year :—

			Rs.	A.	P.
Receipts ...	...	...	2,850	12	9
Expenditure—					
Establishment ...	...	...	2,680	6	1
Capital ...	...	...	595	5	0
Labour ...	...	...	2,559	3	0
Seeds, manures, implements	...	...	415	10	0
Cattle food	...	...	532	14	0
Miscellaneous	...	...	854	5	3

9. *Acknowledgments.*—We are indebted to Messrs. Annett and Meggitt for analyses and heartily record our thanks for the same.

10. *Management.*—Babu Jamini Kumar Biswas was the Superintendent in charge during the year. He worked well and conscientiously. Mr. Birt supervised the work until 1st April, when supervision was made over to Mr. Smith.

The Director of Agriculture, the Agricultural Adviser to the Government of India and the Imperial Bacteriologist visited the station during the period under report.

F. SMITH,

*Deputy Director of Agriculture, Bengal.*

11. *Appendices—*

- (a) Map of the farm.  
 (b) Valuation of tobacco.

## APPENDIX B.

No. 148, dated Calcutta, the 13th January 1912.

FROM—FREDERICK NÖEL-PATON, Esq., Director-General of Commercial Intelligence,

TO—The Director of Agriculture, Eastern Bengal and Assam.

IN continuation of my letter No. 5275, dated the 16th August 1911, I have the honour to enclose a copy of two reports on the quality and price of the samples of tobacco sent for valuation to the Imperial Institute. The firm referred to in the penultimate paragraph of the report on the sample of "Little Flemingen" tobacco is the British American Tobacco Company, Limited, of 86, Strand Road, London, W. C., and I am informed by the Director of the Imperial Institute at the Company has sent out last month a leaf expert to India, who will probably visit the Burirhat Farm in order to obtain information as to the possibility of placing the tobacco on the market.

## RESULTS OF THE EXAMINATION OF TOBACCO FROM INDIA.

## DESCRIPTION.

*"Sumatra, Mark A Cigar Wrapper," weight 2lbs.*

THE sample was in good condition, the leaves being practically free from surface blemishes. The only noticeable defects were a few "Burns" on some of the leaves. The size of the leaves varied from  $25\frac{1}{2}$  by 11 inches to  $17\frac{1}{2}$  by  $4\frac{3}{4}$  inches. The colour varied in different leaves from orange brown to a light warm brown, but was fairly uniform in each leaf. The texture of the leaves good and they were thin, elastic and tough. The tobacco burnt well, leaving a grey ash.

Results of examination expressed on material as received—

					Per cent.
Moisture	...	...	...	...	14.67
Nicotine	...	...	...	...	1.79
Nitrogen	...	...	...	...	1.15
Ash ...	...	...	...	...	19.15

The ash contained :—

Lime $\text{CaO}$	...	...	...	22.96
Magnesia $\text{MgO}$	...	...	...	8.45
Potash $\text{K}_2\text{O}$	...	...	...	29.79
Soda $\text{Na}_2\text{O}$	...	...	...	0.93
Sulphates, expressed as sulphuric acid $\text{S}_3\text{O}$	...	...	...	2.68
Chlorides, expressed as chlorine $\text{Cl}_1$	...	...	...	0.51

### COMMERCIAL VALUATION AND REMARKS.

The sample was submitted for valuation to a firm of merchants and to a firm of cigar manufacturers. The merchants considered that the prominent veins would render the material unsuitable for cigars, but that it would be very suitable for pipe tobacco if shipped in good dry condition. They valued it at about 7d. per lb. delivered in London. The cigar manufacturers reported that the tobacco was sweet and pleasant in flavour when made into cigars and they considered that it would be valuable as a cigar "wrapper" when used with "filler" tobacco of similar growth (*i.e.* Indian grown leaf) although it did not blend well with Western tobaccos. They added that the colour of the sample was yellow inclining to red, that the stalk was rather heavy, and that the leaves were under-fermented and not properly matured; but they considered that it would be distinctly worthwhile to persevere with the cultivation of this tobacco.

The sample was of satisfactory composition, but contained rather more moisture than is desirable in tobacco for export to the United Kingdom. Tobacco forwarded for sale in the United Kingdom should be packed in such a condition that it will contain about 15 per cent. of moisture on arrival.

### RESULTS OF THE EXAMINATION OF TOBACCO FROM INDIA.

*"Little Flemingen, flue-cured Cigarette Tobacco", weight 1½ lbs.*

The sample was in very good condition, and the leaves were particularly free from surface blemishes, though a small amount of micaceous sand was present on a few of them. The shape of the leaves was rather irregular. They varied in size from 22 by 10½ inches to 15 by 5 inches. The colour was medium light yellow to orange brown, and fairly uniform throughout. The texture was fine, though the veins showed rather prominently, and in some cases were white. The tobacco burnt well, leaving a dark grey ash.

Results of examination expressed on materials as received—

					Per cent.
Moisture	...	...	...	...	15.70
Nicotine	...	...	...	...	1.72
Nitrogen	...	...	...	...	1.38
Ash	...	...	...	...	16.14



## The ash contained—

Lime (CaO) ...	...	...	24.15
Magnesia (MgO) ...	...	...	5.24
Potash (K <sub>2</sub> O) ...	...	...	25.60
Soda (Na <sub>2</sub> O) ...	...	...	2.22
Sulphates, expressed as sulphuric acid (S <sub>3</sub> O) ...	...	...	0.90
Chlorides, expressed as chlorine Cl ...	...	...	0.19

*Commercial valuation and remarks.*

The sample was submitted to a firm of merchants and to two firms of manufacturers. The merchants considered that the material should be very suitable for pipe tobacco if shipped in good dry condition, and valued it at about 6*d.* per lb. delivered in London. One firm of manufacturers reported that the tobacco was very thin, but was of good colour and burnt well, and they valued it at about 8*d.* per lb.

The second firm of manufacturers stated that the tobacco burnt well, but that the flavour was a little sharp and disagreeable. They passed the sample on to another firm, who expressed considerable interest in the tobacco and stated that they would be glad to receive particulars as to prices and the quantity available.

The composition of this sample was satisfactory, though the percentage of moisture was rather high for tobacco intended for export to the United Kingdom. The sample was of very promising quality, and if cured, a little brighter and properly graded and packed similar tobacco would probably realise good prices on the English market as a substitute for Virginian pipe tobacco. The latter is at present worth 5*d.* to 1*s.* per lb in London according to quality (December 1911).

## Sumatra—

MESSRS. MACROPOLO &amp; Co., BOMBAY—

## Valuation of Fire-cured Cigarette Tobacco—

				Rs.	
White Burley—					
Valuation 1	...	...	...	65	per maund.
2	...	...	...	50	„
3	...	...	...	20	„

## APPENDIX C.

## CROPPING SCHEME 1912-13.

See paragraph on soils Tobacco.

Block A	White Burley	...	...	1 acre.
„ B	Sumatra	...	...	2 acres.
	White Burley	...	...	1 acre.

## Block D. Virginian—

White Burley	....	...	2.52 acres.
Local Bhengi	...	...	.26 acre.
Turkish Cavalla	...	...	.42 „
Aya solouk	...	...	.25 „
Some sown	...	...	.33 „
Connecticut seed leaf	...	...	.45 „

## Block E. American—

Sumatra	...	...	1.92 acres.
White Burley	...	...	2.53 „
Little Flemingen	...	...	.68 „
Yellow Prior	...	...	} .100 „
Canon Burley	...	...	

Scale 150 Feet = 1 Inch  
Season 1911-1912

Season 1911-1912















